

Healthcare Providers' Knowledge and Perceptions of Electronic Health Records and Perceived Effect on Health Service Delivery in Tertiary Health Facilities in Uyo, Nigeria

Mfonobong Udoh^{1,*}, Humphrey Okeke², Lucy Edet³, Nelson Osuchukwu⁴

¹Department of Physiotherapy, University of Uyo Teaching Hospital, Uyo, Nigeria

²Department of Physiotherapy, Faculty of Allied Medical Sciences, University of Calabar, Calabar, Nigeria

³Department of Physiotherapy, Faculty of Basic Clinical Sciences, University of Uyo, Uyo, Nigeria

⁴Department of Public Health, Faculty of Allied Medical Sciences, University of Calabar, Calabar, Nigeria

Email address:

mfonobongedoabasi@gmail.com (Mfonobong Udoh), okekehumphrey70@gmail.com (Humphrey Okeke),

lucy.inyang.edet@gmail.com (Lucy Edet), nelsonosuchukwu@yahoo.com (Nelson Osuchukwu)

*Corresponding author

To cite this article:

Mfonobong Udoh, Humphrey Okeke, Lucy Edet, Nelson Osuchukwu. Healthcare Providers' Knowledge and Perceptions of Electronic Health Records and Perceived Effect on Health Service Delivery in Tertiary Health Facilities in Uyo, Nigeria. *World Journal of Public Health*. Vol. 8, No. 3, 2023, pp. 243-251. doi: 10.11648/j.wjph.20230803.18

Received: August 15, 2023; **Accepted:** September 4, 2023; **Published:** September 13, 2023

Abstract: Electronic health record (EHR) is an efficient ICT tool for processing health data in real-time. Nigeria lacks an active e-health profile owing to financial, organizational and human factors such as poor computer literacy, resistance to change etc. This was a cross-sectional descriptive study which sought to determine healthcare providers' knowledge and perceptions of electronic health records and their perceived effect on health service delivery in tertiary health facilities in Uyo, Nigeria. A semi-structured questionnaire was distributed to 400 healthcare providers recruited via proportionate sampling technique from two tertiary health facilities in the study location. Data was analyzed using SPSS 25, hypotheses were tested using chi-square statistics. Findings showed that majority, 335 (83.6%) of the respondents had fair to good (16% and 65% respectively) knowledge of the EHR. Of the 121 respondents who had used the EHR, 94 (77.6%) had positive perceptions of the technology, 82 (67.8%) reported improvement in patients' outcomes. Eased access to patient data, 91 (81.0%); reduced waiting time, 74 (61.2%); secured means of data storage, 88 (72.7%); lessened workload, 75 (61.9%); improved patients' satisfaction of services rendered, 79 (65.3%) and reduced health cost, 41 (34.7%). A relationship was established between healthcare providers' perceptions of EHRs and perceived effect on health service delivery ($p = 0.007 < 0.05$). There was no relationship between healthcare providers' knowledge of the EHR and perceived effect on health service delivery whereas, their positive perceptions of the system had an equal positive perceived effect on health service delivery in the study location.

Keywords: EHR, Healthcare Providers, Knowledge, Perceived Effect, Perception

1. Introduction

1.1. Background

There is presently a heightened global interest on the capacity of electronic health records (EHRs) to minimize the cost of provision of health services and supplies while sufficiently contributing to the improvement of the quality of care, efficiency, resource management, utilization in public health disease surveillance and intervention amongst others

[1, 2]. It is worthy of note that, with the advent of the EHR technology, the myriad of problems associated with paper-based records have been curtailed in the healthcare systems in the regions where this technology has been implemented [3]. Despite its enormous benefits, the take-up and implementation of EHR in developing countries around the globe have encountered an array of barriers ranging from poor economy to poor infrastructure, poor attitude and perception from prospective users, effort required for the adoption and usage, technical barriers, resistance to new

technology etc. [3]. However, health service providers are more likely to accept EHR if they are made to realize its advantages, are computer literate, the EHR user-interface is friendly, they are assured that data is safe and secure and are well-involved in the EHR development process [4]. Acceptance of this technology also means that it is trusted by the healthcare personnel as regards the standard of data it possesses while they maintain their focus on service delivery even as the system is made to adapt to their work procedures [4].

Third world countries, including sub-Saharan Africa, suffer from the world's most devastating epidemics, such as malaria, tuberculosis, HIV/AIDS and ebola; these could majorly be attributed to under performance of their public health system which is also associated with mundane and out-of-date paper-based practice of health information management (HIM). These paper-based records possess problems such as poor data documentation, poor standardization, human errors, repetitions, time wastage, huge wages, frequent loss of data and their attendant financial burden [5]. The implications of these problems in healthcare span from increased health cost and funding to poor optimization of the healthcare delivery system. Therefore, the deployment of ICT to improve healthcare is of upper-most importance in these regions [6].

Nigeria e-health policy has been developed since 2007, however, the country was not enlisted in 2015 amongst countries with an active e-health profile, a pointer that there has been little or no achievement in that regard [7]. The World Health Organization (WHO) has delineated the inadequacy of the Nigeria's health information system as a major setback in the monitoring and analysis of health indicators in the healthcare system [7]. Apart from the huge funding gap for the National Strategic Health Development Plan (NSHDP) in the last couple of years (12.3% gap in 2018, 19.9% gap in 2019 and a whopping 30.8% gap as was projected for 2020) [8], the other significant barriers to the implementation of the EHR in Nigeria include lack of user acceptability and interoperability issues. Deployment of a standard EHR system is cardinal in the improvement of healthcare system in the country, however, healthcare providers' knowledge, positive perceptions and attitude towards the EHR technology is a major determinant of its implementation. Hence, this study was intended to provide empirical data on health care providers' knowledge and perceptions of EHR and perceived effect on health service delivery in tertiary health facilities in Uyo, Nigeria. Specifically, to determine the level of knowledge of the EHR technology amongst healthcare providers in the study location; to determine the perceptions of the healthcare providers of the EHR technology in the study location; and to determine the perceived effect of the EHR technology on certain aspects of health service delivery in the study location. Hypotheses were tested to determine the relationship between healthcare providers' knowledge/perceptions of electronic health records and perceived effect on health service delivery in tertiary health facilities in Uyo, Nigeria.

1.2. Theoretical Framework

This study is predicated on two major theoretical frameworks. They are the theory of interoperability, and EHR technology acceptance and use model (EHRTAUM). Interoperability is defined as the capacity of systems and devices to exchange information and interpret the shared information [9]. For systems to be termed interoperable, there must be interchange of data between them such as which can be interpretable and understood by the end user [9]. The health services industry is a very diversified and complex one, with players with varied portfolios catering to an even more varied and complex group of customers [10]. Although varied sources and methods are used by health care providers to capture and develop patient-level data, EHRs as data sources possess huge capacity to provide timely and appropriate data. González et al., [11] stated that in order to meet the demand of improving efficiency of patient's care and quality, as well as prevention and homecare, EHRs have to support interoperability.

The technology acceptance model (TAM) developed by [12] consists of two major constructs; perceived usefulness (PU) and perceived ease of use (PEOU), as relevant in computer use behaviors. Ajibade (2018) [13] further proposed the technology acceptance and use model (TAUM) which identified the influence of organizational policies on technology acceptance. Therefore, as a working model, EHRTUAM proposes that the healthcare providers' previous knowledge, skills and experiences with ICT cumulatively stimulate their positive perceptions about the ease of use, and usefulness of the EHR technology; these further strengthened by organizational policies lead to adoption of the technology.

2. Method

2.1. Study Area

This study was carried out at tertiary health facilities in Uyo, Akwa Ibom State. Uyo is the capital of Akwa Ibom State which is one of the 36 States in the Federal Republic of Nigeria. It lies between latitude 5° 2" north of the Equator and longitude 7° 55" east of the Greenwich meridian.

2.2. Study Design

This was a cross-sectional descriptive survey.

2.3. Study Population

The population for this study included doctors, nurses, medical laboratory scientists, pharmacists, physiotherapists, radiographers, dental technologists, dietitians, optometrists, pharmacist technicians and health information officers working in the tertiary health facilities in the study location.

2.4. Sample Size Determination

The Cochran's formula [14] was used to calculate the sample size for this study. It states that sample size $n = Z^2 pq/e^2$. For this study population, the researchers adopted a 95% confidence interval (z score = 1.96), with a margin of error of 5% (0.05) and

maximum variability of the population at 50% (0.5). Therefore, $n = 1.962 \times 0.5 \times 0.5 / 0.052 = 384.16$. However, this sample size was effectively adjusted to accommodate probable non-response. Therefore, considering a non-response rate of 10% (0.1), the final sample size (FSS) was calculated as follows: $FSS = n / 1 - \text{non-response rate} = 384.16 / 1 - 0.1 = 426.8 \approx 427$. The final sample size for this study was four hundred and twenty seven health personnel.

For the individual sample sizes of medical and health personnel that were representative of their individual target populations, a proportionate sampling procedure was utilized as given in table 1 as follows.

Table 1. Proportionate sampling of respondents.

Healthcare Provider	Population	%	Sample size
Nurses	502	39.0	167
Doctors	283	22.0	94
Medical laboratory scientists	129	10.0	43
Pharmacists	116	9.0	38
Physiotherapists	64	5.0	21
Health information officers	90	7.0	30
Dental technologists	26	2.0	9
Radiographers	51	4.0	17
Optometrists	13	1.0	4
Pharmacist technicians	6	0.5	2
Dietitians	6	0.5	2
Total	1286	100	427

2.5. Sampling Technique

For recruitment of health facilities and participants for the study, a multi-stage sampling procedure was adopted as follows: first stage involved the recruitment of healthcare facilities while the second stage involved the recruitment of study participants. Then, using proportionate sampling technique as shown in table 1, study participants were selected according to their target populations in each of the facilities. The aggregate of sample sizes in both facilities made up the final sample size for this study.

2.6. Instrument for Data Collection

This cross-sectional descriptive survey was conducted via the use of questionnaire. A total of four hundred and twenty seven (427) copies of the self-administered questionnaire were distributed in this survey as follows; three hundred and seventy seven (377) copies of the questionnaire were distributed in one of the facilities which had a larger population of health professionals, while, fifty (50) copies were distributed in the second facility. At a response rate of ninety four percent (94%), an aggregate of four hundred (400) copies of the instrument were retrieved for data collation. The instrument was a semi-structured questionnaire with focus on healthcare providers' knowledge and perceptions of the EHR technology, current procedures of data documentation in the study facilities, the perceived effect of utilization of the technology on certain aspects of health service delivery, and perceived barriers to the implementation of EHRs in the selected health facilities.

2.6.1. Validation of Instrument

Validation of the data collection instrument was done via face validity and pilot testing.

2.6.2. Data Collection Procedure

The procedure for data collection was by self-administration of the questionnaire by respondents.

2.7. Methods of Data Analysis

The data obtained were first coded on the statistical product and service solutions (SPSS) software version 25 then analyzed using the software. Categorical variables were coded from one to the last in each category, answer options were also coded accordingly. Summation of all correct responses gave a perfect score. A range of scores from zero to three was used to grade a respondent's level of knowledge of the technology. Total scores of zero to one were rated as "poor knowledge", scores of 1.5 to 2 were rated as "fair knowledge" while scores of 2.5 to 3 were rated as "good knowledge". Also range of scores from zero to six was used to grade a respondent's level of perception of the technology. Total scores of zero to two were rated as "poor perception", scores of three to four were rated as "fair perception" while scores of five to six were rated as "good perception". Another range of scores from zero to seven was used to grade perceived effect of utilization on service delivery. Total scores of zero to two were rated as "poor effect", scores of three to five were rated as "fair effect" while scores of six to seven were rated as "good effect". Categorical variables were expressed as percentages and frequency counts displayed on tables. Chi-square statistics was used in hypotheses testing to determine the level of significance of the relationship between variables.

3. Results

3.1. Socio-Demographics of Respondents

Table 2 shows the socio-demographics of the respondents as follows:

Table 2. Socio-demographics of respondents.

Socio-demographic characteristic	Frequency n = 400	Percentage (%)
Gender		
Male	157	39.3
Female	243	60.8
Title		
Doctor	87	21.8
Physiotherapist	24	6.0
Nurse	130	32.5
Pharmacist	42	10.5
Pharm Technician	1	0.3
Dietitian	1	0.3
Optometrist	6	1.5
Med Lab Scientist	48	12.0
HIM	28	7.0
Radiographer	25	6.3

Socio-demographic characteristic	Frequency n = 400	Percentage (%)
Dental Technologist Qualification	8	2.0
OND	27	6.8
HND	52	13.0
PGD	6	1.5
Bachelors degree	243	61.0
Masters degree	19	4.8
PhD	4	1.0
Residency	40	10.0
Fellowship	7	1.8
Experience		
Below 5 years	182	45.5
5- 10 years	106	26.5
11 – 15years	62	15.5
Above 15 years	48	12.0

3.2. Relationship Between Socio-Demographic Profile of Respondents and Their Knowledge of EHR Technology

Table three gives a chi square analysis showing the relationship between the socio-demographic profile of respondents and their knowledge of the EHR technology. The p-value of the relationship between gender and healthcare providers' knowledge of EHR is significant, $p = 0.004 < 0.05$ level of significance. The result shows that male professionals had more knowledge of the technology than their female counterparts in the study location. With regards to educational level, the p-value of its relationship with healthcare providers' knowledge of EHR is significant, $p = 0.033 < 0.05$ level of significance. The result indicates that health professionals who held a fellowship were more knowledgeable about the technology than others in the study location.

Table 3. Relationship between socio-demographics of respondents and their knowledge of EHR.

Socio-demographic characteristic	Level of knowledge			Frequency n = 400 n (%)	χ^2	P-value
	Poor n (%)	Fair n (%)	Good n (%)			
Gender						
Male	14 (8.9)	29 (18.5)	114 (72.6)	157 (100)	10.87	0.004
Female	51 (20.9)	46 (18.9)	146 (60.1)	243 (100)		
Title						
Doctor	5 (5.7)	22 (25.3)	60 (68.9)	87 (100)	30.95	0.056
Physiotherapist	2 (8.3)	3 (12.5)	19 (79.2)	24 (100)		
Nurse	27 (20.8)	24 (18.5)	79 (60.7)	130 (100)		
Pharmacist	8 (19.0)	5 (11.9)	29 (69.0)	42 (100)		
Pharm tech	1 (100)	-	-	1 (100)		
Dietician	-	-	1 (100)	1 (100)		
Optometrist	-	1 (16.6)	5 (83.3)	6 (100)		
Med Lab Sct	11 (22.9)	10 (20.8)	27 (56.3)	48 (100)		
HIM	2 (7.1)	5 (17.9)	21 (75.0)	28 (100)		
Radiographer	7 (28.0)	2 (8.0)	16 (64.0)	25 (100)		
Dental tech	2 (25.0)	3 (37.5)	3 (37.5)	8 (100)		
Educational level						
OND	3 (11.1)	5 (18.5)	19 (70.4)	27 (100)	25.21	0.033
HND	18 (33.9)	10 (18.9)	25 (47.2)	53 (100)		
PGD	1 (16.7)	3 (50.0)	2 (33.3)	6 (100)		
Bachelor	39 (15.9)	45 (18.4)	160 (65.8)	244 (100)		
Master	2 (10.5)	4 (21.1)	13 (68.4)	19 (100)		
PhD	-	1 (25.0)	3 (75.0)	4 (100)		
Residency	12 (30.0)	6 (15.0)	32 (80.0)	40 (100)		
Fellowship	-	1 (14.3)	6 (85.7)	7 (100)	4.10	0.664
Work experience						
Below 5 yrs	29 (15.8)	31 (16.9)	124 (67.4)	184 (100)		
5 – 10 yrs	16 (15.1)	18 (16.9)	72 (67.9)	106 (100)		
11 – 15 yrs	12 (19.4)	13 (20.9)	37 (59.7)	62 (100)		
Above 15 yrs	8 (16.7)	13 (27.1)	27 (56.3)	48 (100)		

P value is significant at $p < 0.05$

3.3. Relationship Between the Socio-Demographic Profile of Respondents and Their Perceptions of EHR Technology

Table four gives a chi square analysis showing the relationship between the socio-demographic profile of respondents and their perceptions of EHR technology. The p-value of the relationship between healthcare providers'

work experience and their perceptions of EHR is significant, $p = 0.021 < 0.05$ level of significance. The result indicates that healthcare professionals with more than fifteen years of work experience had better perceptions of the technology than others in the study location. Therefore, positive perceptions of the EHR technology increased with years of work experience.

Table 4. Relationship between socio-demographics of respondents and their perceptions of EHR.

Socio-demographic characteristic	Level of Perception			Freq n = 400 n (%)	χ^2	P-value
	Poor n (%)	Fair n (%)	Good n (%)			
Gender						
Male	16 (10.2)	56 (35.7)	85 (54.1)	157 (100)	2.74	0.254
Female	30 (12.4)	102 (41.9)	111 (45.7)	243 (100)		
Title						
Doctor	13 (14.9)	30 (34.5)	44 (50.6)	87 (100)	13.48	0.856
Physiotherapist	2 (8.3)	9 (37.5)	13 (54.2)	24 (100)		
Nurse	13 (10.0)	56 (43.1)	61 (46.9)	130 (100)		
Pharmacist	7 (16.7)	19 (45.2)	16 (38.1)	42 (100)		
Pharm tech	-	1 (100)	-	1 (100)		
Dietician	-	-	1 (100)	1 (100)		
Optometrist	1 (16.7)	3 (50.0)	2 (33.3)	6 (100)		
Med Lab Sct	5 (10.4)	13 (27.1)	30 (62.5)	48 (100)		
HIM	2 (7.1)	13 (46.4)	13 (46.4)	28 (100)		
Radiographer	2 (8.0)	10 (40.0)	13 (52.0)	25 (100)		
Dental tech	1 (12.5)	4 (50.0)	3 (37.5)	8 (100)		
Educational level						
OND	4 (14.8)	15 (55.6)	8 (29.6)	27 (100)	19.16	0.261
HND	4 (7.6)	24 (45.3)	25 (47.2)	53 (100)		
PGD	-	1 (16.7)	5 (83.3)	6 (100)		
Bachelors	32 (13.1)	95 (38.9)	117 (47.9)	244 (100)		
Masters	1 (5.3)	3 (15.8)	15 (78.9)	19 (100)		
PhD	-	1 (25.0)	3 (75.0)	4 (100)		
Residency	5 (12.5)	16 (40.0)	19 (47.5)	40 (100)	17.97	0.021
Fellowship	-	3 (42.9)	4 (57.1)	7 (100)		
Work experience						
Below 5 yrs	26 (14.1)	65 (35.3)	93 (50.5)	184 (100)		
5 – 10 yrs	11 (10.4)	53 (50.0)	42 (39.6)	106 (100)		
11 – 15 yrs	7 (11.3)	21 (33.9)	34 (54.8)	62 (100)		
Above 15 yrs	2 (4.2)	19 (39.6)	27 (56.3)	48 (100)		

3.4. Figure 1

Figure 1 gives a summary of respondents' level of knowledge of the EHR as follows:

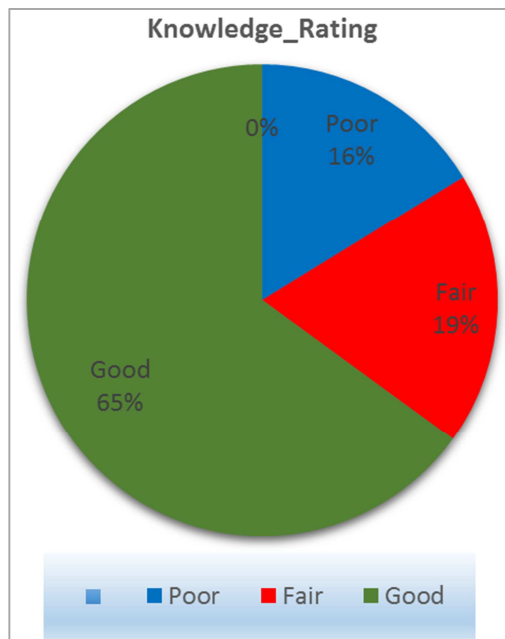


Figure 1. Summary of respondents' level of knowledge of the EHR technology.

3.5. Figure 2

Figure 2 gives a summary of respondents' perceptions of the EHR as follows:

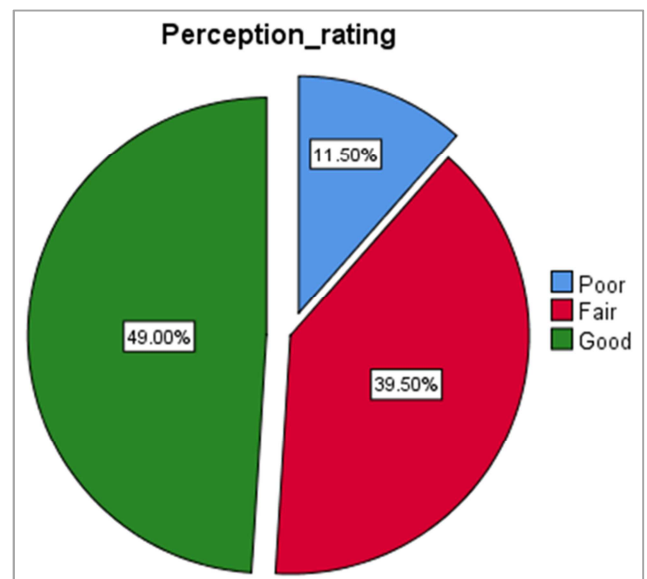


Figure 2. Summary of respondents' perceptions of the EHR technology.

3.6. Table 5 Gives Breakdown of the Data Documentation Procedures in Respondents' Facilities as Follows

Table 5. Clinical data documentation procedure in respondents' facilities.

Utilization	Frequency n = 400	Percentage (%)
Personal use of EHR		
Yes	121	30.3
No	279	69.7
Facility's data storage procedure		
EHR system	11	2.8
Computer	26	6.5
Paper format	270	67.6
Electronic and paper	93	23.3
Facility's electronic transmission of notifiable diseases		
Yes	68	17.0
No	235	58.8
Not sure	97	24.3
Incapability	n=235	
Our facility	121	51.5
Recipient facility	13	5.5
Both facilities	43	18.3
Not certain	58	24.7

3.7. Perceived Effects of EHR on Health Service Delivery

Out of the 121 respondents who had used the technology, 98 (81.0%) stated that it had improved access to patient information; 74 (61.2%) stated that it reduced patients' waiting time; 88 (72.7%) stated that it is a secured and reliable means of data storage; 82 (67.8%) stated that utilization had improved patient care outcomes; 25 (20.7%) opined that it increased their workload; and 79 (65.3%) claimed that the technology had improved patients satisfaction with their services. On whether EHR increases healthcare cost, 40 (33.1%) of the 121 respondents were of the opinion that it increased healthcare cost.

3.8. Test of Hypotheses

H₀₁: There is no significant relationship between healthcare providers' knowledge of electronic health records and perceived effect on health service delivery in tertiary health facilities in Uyo, Nigeria.

H₀₂: There is no significant relationship between healthcare providers' perceptions of electronic health records and perceived effect on health service delivery in tertiary health

facilities in Uyo, Nigeria.

i) Table six below shows result of the chi-square analysis between healthcare providers' knowledge of EHRs and perceived effect on certain aspects of health service delivery in the under-studied facilities. The p-value of the relationship between healthcare providers' knowledge of EHR and perceived effect on health service delivery was not significant, $p = 0.721 > 0.05$ level of significance. This result indicates that good knowledge of the EHR technology amongst health professionals has no perceived effect on health service delivery in the under-studied facilities.

ii) Table seven below shows result of the chi-square analysis between healthcare providers' perceptions of EHRs and perceived effects on certain aspects of health service delivery in the under-studied facilities. The p-value of the relationship between healthcare providers' perceptions of EHR and perceived effect on health service delivery was significant, $p = 0.007 < 0.05$ level of significance. The result indicates that positive perception of the EHR technology by health professionals has perceived positive effect on health service delivery in the under-studied facilities.

Table 6. Relationship between healthcare providers' knowledge of EHRs and perceived effect on health service delivery.

Knowledge	Level of effect on service delivery				Freq n = 118 n (%)	χ^2	P-value
	Very poor n (%)	Poor n (%)	Fair n (%)	Good n (%)			
Poor	-	1 (50.0)	-	1 (50.0)	2 (100)	3.67	0.721
Fair	1 (16.7)	2 (33.3)	2 (33.3)	1 (16.7)	6 (100)		
Good	12 (10.9)	20 (18.2)	30 (27.3)	48 (43.6)	110 (100)		

P value is significant at $p < 0.05$

Table 7. Relationship between healthcare providers' perceptions of EHRs and perceived effect on health service delivery.

Perception	Level of effect on service delivery				Freq n = 118 n (%)	χ^2	P-value
	Very poor n (%)	Poor n (%)	Fair n (%)	Good n (%)			
Poor	2 (50.0)	-	1 (25.0)	1 (25.0)	4 (100)	17.55	0.007
Fair	1 (2.5)	11 (27.5)	16 (40.0)	12 (30.0)	40 (100)		
Good	10 (13.5)	12 (16.2)	15 (20.3)	37 (50.0)	74 (100)		

P value is significant at $p < 0.05$

4. Discussion

Findings from this research revealed that an overwhelming majority of healthcare professionals had basic computer skills and training, more so, they had fair to good knowledge and positive perceptions of the EHR technology. Experiences and skills in information and communication technology (ICT) are usually the motivation for adoption of a new technology. Therefore, these findings support the “EHR technology and use model” (EHRTAUM), the concept on which this paper is predicated. This concept proposes that the healthcare provider’s previous knowledge, skills and experiences with ICT cumulatively stimulate their positive perceptions about the ease of use, as well as usefulness of the EHR technology; based on the nature of tasks required, these positive perceptions further drive the motivation and attitude to adopt the technology which serves as an enhancer of the healthcare delivery system at large. These findings are also consistent with literature regarding influence of ICT skills on the acceptance of EHR technology. Adams (2015) [15] reported that nurses with computer skills and more years of experience favored the use of EHR, while those not in support faulted factors such as poor computer literacy. Literature emphasizes that majority of healthcare professionals show positive attitude toward EHR adoption if they possess good computer skills, had good knowledge, previous training on EHR and also had managerial support [16, 17]. The major constructs of technology acceptance model (TAM) which are perceived usefulness (PU) and perceived ease of use (PEOU) [12] were of significant values in this survey; out of the one hundred and twenty one (121) respondents who reported to have used the EHR, ninety eight percent (98%) rated the technology as useful, (i.e. PU), while seventy percent (70%) (including those who had not used it) of the total number of respondents (400) perceived the technology to have specific usefulness in health information management. Some of the specific usefulness of EHRs as reported by the respondents were ease of access to information, ability to reduce patient waiting time, a secure and reliable means of data storage amongst others. This finding is consistent with those of Tubaishat (2018) [17] who reported high mean scores for PU of EHR by nurses in Jordan. Based on TAM, this result signifies acceptance of the technology by the healthcare providers, which if strengthened by organizational policies would accelerate the implementation and utilization of the technology in the study location. In addition, seventy four percent (74%) of respondents in this survey perceived that EHRs had potential of improving patients’ outcomes. It is widely acclaimed that the EHR holds such benefits as; improved quality of care, efficiency, resource management, cost reduction, utilization in public health disease surveillance and control intervention amongst others [18, 19]. On the relationship between healthcare providers’ knowledge and perceptions of EHRs and perceived effect on health service delivery in the understudied facilities, a good number of the respondents

(67.8%) reported that the use of the technology had improved their patients’ outcomes, 81.0% asserted that it eased access to patient data, 61.2% stated that it reduced waiting time while 72.7% reported that it was a secured means of data storage. Also, 61.9% of the respondents reported that it helped lessen their workload, 65.3% reported that it had improved patients’ satisfaction of their services while 34.7% asserted that it helped to reduce health cost. These results support the increasing publications that EHRs can be beneficial to protocols and outcomes, and that their deployment can be considered as a healthcare management intervention [20]. It has been documented that enhanced services brought about by the use of EHR have led to improvement in service delivery. Some of the patient-centered services that have been documented are; quick access to patient data at point-of-care, data transmission in real-time, provision of clinical reminders, recording of patients’ medication and allergies, quick identification of operational problems, better patient engagement through online portals, reduction in patient waiting time etc. [18].

Analysis of the first hypothesis showed that the p-value of the relationship between healthcare providers’ knowledge of the EHR and perceived effect on health service delivery in the study location was not significant, $p = 0.721 > 0.05$ level of significance. Therefore, we failed to reject H_{01} and concluded that there is no significant relationship between healthcare providers’ knowledge of electronic health records and perceived effect on health service delivery in the study location. This implies that good knowledge of the EHR technology amongst health care providers’ has no perceived effect on health service delivery in the understudied facilities. For the second hypothesis, the p-value of the relationship between healthcare providers’ perceptions of the EHR and perceived effect on health service delivery in the study location was significant, $p = 0.007 < 0.05$ level of significance. Therefore, we rejected H_{02} and concluded that there is a statistically significant relationship between healthcare providers’ perceptions of electronic health records and perceived effect on health service delivery in the study location. This result implies that good perceptions of the technology by healthcare providers has perceived positive effect on health service delivery such as in encouraging its utilization which could lead to improved access to modern, quality and efficient health care services in the understudied area.

5. Conclusion

Healthcare providers’ knowledge, positive perceptions and attitude towards the EHR technology are viewed as the bedrock for the implementation of the technology. Users’ previous experiences with the system influence their perceptions about the ease of use and usefulness of the system which in turn drive a positive view for the actual use of the technology. Results showed that an overwhelming majority of

healthcare professionals in the study location had good knowledge and perceptions of the EHR technology. 329 (82.0%) respondents reported to have heard of the technology. In terms of perceptions, out of the one hundred and twenty one (121) respondents who reported to have used the EHR, majority, 78% had positive perceptions of the technology. Though actual usage was abysmal, however, improved service delivery had been reported amongst the users. The results also suggested that healthcare providers' knowledge of the EHR system had no perceived effect on health service delivery whereas, their positive perceptions of the system had an equal perceived positive effect on health service delivery in the understudied facilities. On this premise, it is recommended that the understudied facilities and indeed all healthcare institutions should provide training, managerial and expert support for the users of the system to encourage the transitioning from paper to the electronic health records. Further research on other barriers and way forward to the implementation of the technology is also recommended.

Ethical Considerations

Ethical approval was obtained from Institutional Health Research Ethical Committee (IHREC) of University of Uyo Teaching Hospital, Uyo, Nigeria with approval number UUTH/AD/S/96/VOL.XXI/578.

Confidentiality / Anonymity

All information and responses obtained from this study remained undisclosed to third parties. Respondents' rights and confidentiality were maintained throughout the duration of the study.

Informed Consent

Respondents were recruited on voluntary basis. Their informed consent was duly sought and obtained, using a consent form after the purpose and nature of the study were clearly explained.

Declaration of Conflicting Interests

The authors declare that there is no conflict of interest.

Limitation of the Study

Insufficient current research studies from other climes and an almost absence of data and resources applicable to the study in our immediate environment constituted limitations to this study.

Acknowledgements

We acknowledge the invaluable contributions of Dr. Auwal Abdullahi and Dr. Bernadine Ekpenyong toward the completion of this research.

References

- [1] McGinn, C. A., Gagnon, M., Shaw, N., Sicotte, C., Mathieu, L., Leduc, Y., Legare, F. (2012). User's perspectives of key factors to implementing electronic health records in Canada: A Delphi study. *BMC Medical Informatics and Decision Making*, 12 (105), 1-13.
- [2] Dover, L. L. (2019). Improved Diagnostics and Patient Outcomes. Retrieved from Healthit.Gov: <https://healthit.gov/topic/health-it-and-health-information-exchange-basics/improved-diagnostics-patient-outcomes>
- [3] Lei, W., Xin, W., Zubedi, A., & Hashim, M. (2020). DANP-based method for the adoption of hospital information system. *International Journal of Computer Applications in Technology*, 62 (1), 57-65.
- [4] Razzaque, A., & Jalal-Karim, A. (2010). Conceptual healthcare knowledge management model for adaptability and interoperability of EHR. *European Mediterranean & Middle Eastern Conference on Information Systems*, 1-23.
- [5] Ajami, S., & Bagheri-Tadi, T. (2013). Barriers for adopting Electronic health records (EHRs) by physicians. *Acta Informatica Medica*, 21 (2), 129-134.
- [6] Akanbi, M., Ocheke, A., Agaba, P., Daniyam, C., Agaba, E., Okeke, E., & Ukoli, C. (2012). Use of electronic health records in sub-Saharan Africa: Progress and Challenges. *Journal of Medicine in the Tropics*, 14 (1), 1-6. Retrieved August 28, 2018, from NCBI database.
- [7] Bello, O. W., Faruk, N., Oloyode, A. A., & Popoola, S. I. (2016). Driving electronic health record system implementation in Nigeria: A proposal. Retrieved from Research Gate: <https://www.researchgate.net/publication/317844683>
- [8] FMOH. (2018). NSHDP. Second National Strategic Health Development Plan 2018-2022. Nigeria: FGN.
- [9] Bal, P. (2016). Interoperability Project. (Department of Health and Human Services) Retrieved from <http://www.medicare.gov/about-us/nondiscrimination/nondiscrimination-notice.html>
- [10] Dobrev, A., Stroetmann, K., Stroetmann, V., Artmann, J., Jones, T., & Hammerschmidt, R. (2008). The conceptual framework of interoperable electronic health record and ePrescribing systems. Germany: European Commission, Information Society & Media.
- [11] Gonzalez, C., Blobel, B. G., & Lopez, D. M. (2011). Ontology-based Framework for Electronic Health Records Interoperability. *European Federation for Medical Informatics*. Germany: IOS Press. doi: 10.3233/978-1-60750-806-9-694.
- [12] Davis, F. D. (1989). Perceived usefulness, perceived ease of use and user acceptance of information technology. *MIS Quarterly*, 319-340.
- [13] Ajibade, P. (2018). Technology acceptance model limitations and criticisms: Exploring the practical applications and use in technology-related studies, mixed method, and qualitative researches. *Library Philosophy and Practice*, 1-13.
- [14] Cochran, W. (1977). Sampling techniques. New York: John Wiley & Sons.

- [15] Adams, S. L. (2015). Nurses knowlege, skills, and attitude toward electronic health records (EHR). Proquest Dissertations and Theses. Retrieved from <https://scholarworks.waldenu.edu/dissertations/875>
- [16] Berihun, B., Debalkie, D., & Getachew, S. (2020). Willingness to use electronic medical record (EMR) system in healthcare facilities of Bahir Dar City, northwest Ethiopia. *Biomed Research International*, 4 (21), 1-9.
- [17] Tubaishat, A. (2017). Perceived usefulness and perceived ease of use of electronic health records among nurses: Application of technology acceptance model. *Informatics for Health and Social Care*, 43 (3), 1-11.
- [18] Legg, L., & Arnold, K. (2019). Improved Diagnostics and Patient Outcomes. Retrieved from Health IT.gov: <https://www.healthit.gov/topic/health-it-and-health-information-exchange-basics/improved-diagnostics-patient-outcomes>
- [19] Fridsma, D. (2013). EHR Interoperability: The Structured Data Capture Initiative. (Office of the National Coordinator for Health Information Technology) Retrieved from HealthITBuzz: www.healthIT.gov.
- [20] Hoover, R. (2017). Benefits of using an electronic health record. *Nursing Critical Care*, 12 (1), 9-10.